

# Preface

This book was written to help the reader to understand, analyze, and design RF circuits. Developed as a textbook for an RF engineering course at Cornell University, it can also be used for self-study and as a reference for practising engineers. The scope of topics is wide and the level of analysis ranges from introductory to advanced. In each chapter, I have tried to convey an intuitive “how things work” understanding from which the mathematical analysis follows. The initial chapters present the amplifiers, filters, modulators, and demodulators, which are the basic building blocks of radio systems, from AM and FM to the latest digital radio systems. Later chapters alternate between systems, such as television, and radio astronomy, and theoretical topics, such as noise analysis and radio spectrometry. The book provides the RF vocabulary that carries over into microwave engineering, and one chapter is devoted to waveguides and other microwave components.

In this second edition, many chapters have been expanded. Others have been rearranged and consolidated. New chapters have been added to cover radar, the GPS navigation system, digital modulation, information transmission, and *S*-parameter circuit analysis.

The reader is assumed to have a working knowledge of basic engineering mathematics and electronic circuit theory, particularly linear circuit analysis. Many students will have had only one course in electronics, so I have included some fundamental material on amplifier topologies, transformers, and power supplies. The reader is encouraged to augment reading with problem-solving and lab work, making use of mathematical spreadsheet and circuit simulation programs, which are excellent learning aids and confidence builders. Some references are provided for further reading, but whole trails of reference can be found using the internet.

For helpful comments, suggestions, and proofreading, I am grateful to many students and colleagues, especially Wesley Swartz, Dana Whitlow, Bill Sisk, Suman Ganguly, Paul Horowitz, Michael Davis, and Mario Ierkic.

**Jon B. Hagen**  
Brooklyn, NY  
July 2008

