

An Introduction to Radio Frequency Engineering

This book provides a comprehensive introduction to radio frequency (RF) engineering, using a straightforward and easily understood approach combined with numerous worked examples, illustrations and homework problems. The author has focused on minimising the mathematics needed to grasp the subject while providing a solid theoretical foundation for the student. Emphasis is also placed on the practical aspects of radio engineering. The book provides a broad coverage of RF systems, circuit design, antennas, propagation and digital techniques. Written for upper-level undergraduate courses, it will also provide an excellent introduction to the subject for graduate students, researchers and practising engineers.

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This book is dedicated to the memory of Les France and Peter Hattam.

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Preface

The following text evolved out of a series of courses on radio frequency (RF) engineering to undergraduates, postgraduates, government and industry. It was designed to meet the needs of such groups and, in particular, the needs of working engineers attempting to upgrade their skills. Thirty years ago, it appeared as if the fibre optics revolution would relegate wireless to a niche discipline, and universities accordingly downgraded their offerings in RF. In the past 10 years, however, there has been a renaissance in wireless and to a point where it is now a key technology. This has been made possible by the developments in very large-scale integration (VLSI) and CMOS technology in particular. In order to meet the manpower requirements of the wireless industry, there has been a need to upgrade the status of RF training in universities and to provide courses suitable for in-service training. The applications of wireless systems have changed greatly over the past 30 years, as has the available technology. In particular, there is a greater use of digital technologies, and antenna systems can often be of the array variety. The current text has been written with these changes in mind and there has been a culling of some traditional material that is of limited utility in the current age (graphical design methods for example). Material in the book has been carefully chosen to provide a basic training in RF and a springboard for more advanced study. At the author's own institution, RF engineering is now taught in a unified manner that emphasises the relationship between the individual components and the total system. This is part of an international trend that is gathering pace and is necessitated by the total integration of modern RF systems. The student is now expected to be able to appreciate the operation of a total system including electronics, antennas and propagation. Unfortunately, many of the textbooks covering these individual areas are extremely advanced and inappropriate at the intermediate level to which this text is mainly directed. In particular, propagation is ignored almost totally at this level. The current text is designed to service the needs of a broad RF training and to equip the reader with sufficient knowledge to appreciate the more advanced texts of other authors. As a minimum, this book requires the reader to have a basic foundation in electronics and electro-magnetism. At the author's institution the material in the first five chapters forms the basis of an initial course in RF and this is followed by a more advanced course that is based on Chapters 6 to 11.

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