

# Preface to the Adapted Fourth Edition

This edition is the thoroughly revised version of the earlier adapted edition. In order to fulfill the syllabi requirements of the course on Antennas and Wave Propagation followed at UG and PG levels in major Indian universities and technical institutions, the revised edition covers four new chapters on Wave Propagation: Basics of Wave Propagation (Ch 22), Ground Wave Propagation (Ch 23), Space Wave Propagation (Ch 24) and Sky Wave Propagation (Ch 25). Two more chapters on Radiation (Ch 4) and Microstrip Antennas (Ch 14) are incorporated for enhanced coverage of the text. With these incorporations in place, this new text has taken an entirely new shape and promises to be one stop solution on the subject for the user.

The appendices include many useful tables and references, programs and objective type questions. The book features numerous helpful graphical displays. The exercises at the end of chapters are quite challenging and the references to article and books are equally extensive.

## Chapter Organisation

The content of this book is organized into 25 chapters.

**Chapter 1**, *Introduction*, presents basic information on symbols and notations used for numerical derivations in the book. A short history of Antennas is provided for in the chapter for a brief overview on developments in this field.

**Chapter 2**, *Antenna Basics*, covers fundamental antenna concepts and the language of antennas. In this edition, some of the basic terms, viz., Radiation Phenomena, Signal-to-Noise Ratio, Antenna Temperature, Antenna Impedance and Front-to-Back Ratio are explained. Antenna Theorems and a table summarizing antenna parameters are included.

**Chapter 3**, *The Antenna Family*, gives concise descriptions of different types of antennas from dipoles to patches. A brief description of various members of antenna family is included in the revised text.

**Chapter 4**, *Radiation*, is the new chapter which introduces mathematical theory relating to antennas. Discussion on Retarded (time varying) Potential and Far Field due to an Alternating Current Element and Far Field due to Sinusoidal Current Distribution is presented in this chapter.

**Chapter 5**, *Point Sources and their Arrays*, initially treats point sources and their fields, power and phase patterns. Later, the concept of formation of arrays is developed leading to the Broadside and end-fire arrays of point sources.

**Chapter 6**, *Electric Dipoles, Thin Linear Antennas and Arrays of Dipoles and Apertures*, introduces the concept of dipole and later extends to encompass dipoles and linear antennas, both alone and in arrays.

**Chapter 7**, *Loop, Slot and Horn Antennas*, describes all kinds of loop, slot and horn antennas and their properties.

**Chapter 8**, *Helical Antennas*, first introduces axial-mode helical antennas and Yagi-Uda arrays and later includes detailed discussion on helical antennas. The concept of mode is introduced in a new section entitled helix mode.

**Chapter 9**, *Reflector Antennas*, includes all types of reflectors, viz., flat-sheet, corner and parabolic antennas. In the revised chapter, a number of figures illustrating feed arrangements including that of a Cassegrain antenna are given.

**Chapter 10**, *Lens Antennas*, details different kinds of related Antennas.

**Chapter 11**, *Broadband and Frequency-Independent Antennas*, introduces and describes these antennas. Rumsey's principle for Frequency Independent Antennas is discussed in detail.

**Chapter 12**, *The Cylindrical Antenna and the Moment Method (MM)*, is related with Cylindrical Antennas, their types and their applications. The Moment Method and their application in Wire Antennas is covered in the chapter.

**Chapter 13**, *Frequency-Selective Surfaces and Periodic Structures*, introduces the topic and presents different kinds of Randomes.

**Chapter 14**, *Microstrip Antennas*, is a new chapter which deals with the characteristics, advantages and limitations of Microstrip Antennas.

**Chapter 15**, *Antennas for Special Applications*, features many important and novel antenna applications including sections on cellphone antennas, ILS (Instrument Landing System) antennas, LEO (Low Earth Orbit) satellite antennas and many more.

**Chapter 16**, *Practical Design Considerations of Large Aperture Antennas* presents Aperture distribution and efficiencies for design consideration of Large Aperture Antennas.

**Chapter 17**, *Antenna Temperature, Remote Sensing and Radar Cross Section*, completes the material suggested for a first course on antennas.

**Chapter 18**, *Self and Mutual Impedances* presents Mutual Impedance of Parallel Antennas and other configurations in detail. Self Impedance of Thin Linear Antennas is discussed comprehensively in this chapter.

**Chapter 19**, deals with *The Fourier Transform Relation between Aperture Distribution and Far-Field Pattern*. The Spatial Frequency response and Pattern Smoothing and Simple Interferometer is aptly discussed.

**Chapter 20**, *Baluns, etc.* presents useful information on transformers, baluns and traps.

**Chapter 21**, *Antenna Measurements*, presents complete and up-to-date discussion of antenna measurements including network and spectrum analyzers.

The last four chapters are devoted to wave propagation, which includes **Ch. 22** *Basics of Wave Propagation*, **Ch. 23** *Ground Wave Propagation*, **Ch. 24** *Space Wave Propagation* and **Ch. 25** *Sky Wave Propagation*.

### **Web Supplement:**

The web supplements can be accessed at <http://www.mhhe.com/kraus/a4asie>, which contain following material.

*For Instructors:*

- Solution Manual, Power Point Lecture Slides

*For Students:*

- Chapters on Large and Unique Antennas, Terahertz Antenna and Antenna Array Analysis and Synthesis
- Web links for useful reference material

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I have taken care to present the concepts of Antennas & Wave Propagation in user friendly manner and hope that the present edition would be useful for the student and teacher community. The feedback on the book can be sent to me at [ahmadshahidkhan@rediffmail.com](mailto:ahmadshahidkhan@rediffmail.com).

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