PREFACE

In the years since the first edition of *Electric Machinery Fundamentals* was published, there has been rapid advance in the development of larger and more sophisticated solid-state motor drive packages. The first edition of this book stated that dc motors were the method of choice for demanding variable-speed applications. That statement is no longer true today. Now, the system of choice for speed control applications is most often an ac induction motor with a solid-state motor drive. DC motors have been largely relegated to special-purpose applications where a dc power source is readily available, such as in automotive electrical systems.

The third edition of the book was extensively restructured to reflect these changes. The material on ac motors and generators is now covered in Chapters 3 through 6, before the material on dc machines. In addition, the dc machinery coverage was reduced compared to earlier editions. This edition continues with this same basic structure.

In addition, the former Chapter 3 on solid-state electronics has been deleted from the fifth edition. Feedback from users has indicated that that material was too detailed for a quick overview, and not detailed enough for a solid-state electronics course. Since very few instructors were using this material, it has been removed from this edition and added as a supplement on the book's website. Any instructor or student wishing to continue using the material in this chapter can freely download it.

Learning objectives have been added to the beginning of each chapter to enhance student learning.

Chapter 1 provides an introduction to basic machinery concepts, and concludes by applying those concepts to a linear dc machine, which is the simplest possible example of a machine. Chapter 2 covers transformers, which are not rotating machines, but which share many similar analysis techniques.

After Chapter 2, an instructor may choose to teach either dc or ac machinery first. Chapters 3 through 6 cover ac machinery, and Chapters 7 and 8 cover dc machinery. These chapter sequences have been made completely independent of

each other, so that an instructor can cover the material in the order which best suits his or her needs. For example, a one-semester course with a primary concentration in ac machinery might consist of parts of Chapters 1, 2, 3, 4, 5, and 6, with any remaining time devoted to dc machinery. A one-semester course with a primary concentration in dc machinery might consist of parts of Chapters 1, 2, 7, and 8, with any remaining time devoted to ac machinery. Chapter 9 is devoted to single-phase and special-purpose motors, such as universal motors, stepper motors, brushless dc motors, and shaded-pole motors.

The homework problems and the ends of chapters have been revised and corrected, and more than 70% of the problems are either new or modified since the last edition.

In recent years, there have been major changes in the methods used to teach machinery to electrical engineering and electrical technology students. Excellent analytical tools such as MATLAB® have become widely available in university engineering curricula. These tools make very complex calculations simple to perform, and they allow students to explore the behavior of problems interactively. This edition of *Electric Machinery Fundamentals* makes selected use of MATLAB to enhance a student's learning experience where appropriate. For example, students use MATLAB in Chapter 6 to calculate the torque–speed characteristics of induction motors, and to explore the properties of double-cage induction motors.

This text does not teach MATLAB; it assumes that the student is familiar with it through previous work. Also, the book does *not* depend on a student having MATLAB. MATLAB provides an enhancement to the learning experience if it is available, but if it is not, the examples involving MATLAB can simply be skipped, and the remainder of the text still makes sense.

This book would never have been possible without the help of dozens of people over the past 25 years. It is gratifying for me to see the book still popular after all that time, and much of that is due to the excellent feedback provided by reviewers. For this edition, I would especially like to thank:

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Supplemental materials supporting the book are available from the book's website, at www.mhhe.com/chapman. The materials available at that address include MATLAB source code, the supplement "Introduction to Power Electronics", pointers to sites of interest to machinery students, a list of errata in the text, some supplemental topics which are not covered in the main text, and supplemental MATLAB tools.

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